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Where real nebulosity exists it is confined to areas relatively small, seldom exceeding two or three degrees in extent.

The evidence now laid before us may be applied to the interpretation of the large areas of so-called nebulosity shown on many photographs that have been presented to the Society or published in *Knowledge* and in other serials.

Referring again to the six photographs of the *Pleiades* that were taken with the reflector and the 5-inch lens, with exposures respectively of 8^h, $9^h\ 2^m$, and 10^h, it is found that upon those taken with the 5-inch lens the faint stars which are shown on Professor Barnard's photograph with $10\frac{1}{4}$ hours' exposure are also shown, but no trace whatever is there of what he designates as the distant nebulosity. But on the photographs taken simultaneously with them by the 20-inch reflector there is much spurious nebulosity visible; and that it is spurious, and not real, is proved by the fact that, though it appears on each of the three photographs, it does not coincide, either in density, or in position, or in extent, on any of the plates. This could not happen if it were due to real nebulosity, or to concentrated starlight, or even to defects in the lenses; it must be due to chemical and to atmospheric causes, for otherwise the photo-effects would be alike on each of the plates.

The spurious nebulosity is shown in cloud-like patches, and simulates the real nebulosity so closely that its true character could not be decided, with certainty, without the careful correlation of two or more photographs taken at different times of the same areas in the sky.

A Determination of the Proper Motions of the Greenwich Clock Stars from the Greenwich Transit Circle Observations, 1854–1896. By W. G. Thackeray.

The old Greenwich observations of right ascension are, as is well known, affected by systematic errors due to imperfect clock-star places. To get rid of these errors the places of the clock stars for the last twenty-five years have been specially corrected to the results of the 12-hour groups, with what marked success the 1880 and 1890 catalogues have fully demonstrated. To eliminate these errors in a perfectly orthodox method requires a large amount of honest labour, while the application of arbitrary corrections is not altogether satisfactory. As the Greenwich Transit Circle has been in constant use for nearly half a century, and a considerable number of observations of the clock stars have been made with it during this period on a uniform system, it seemed well worth while to discuss the series of observations with a view to compare the results thus obtained with those derived from much longer and varied series by Professors Auwers and Newcomb.

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The right ascensions and north polar distances used in this discussion are those given in the Greenwich 1860, 1864, 1872, 1880 Catalogues, and the results of the ten years' observations 1887–1896 (those not yet published by permission of the Astronomer Royal), modified as fully explained below and reduced to 1890 by the use of the Struve-Peters value of precession, and the proper motions determined by Professor Auwers from Bradley's observations. This system of reduction is generally referred to in this paper as "Auwers'" or "A"; while "Newcomb's" or "N" refers to Professor Newcomb's latest determination of the precession, and proper motions used in his fundamental catalogue for 1900.

Right Ascensions.—The correction for equinox is that determined by a former paper (*Monthly Notices*, vol. lvi. 9) from a discussion of the observations of the Sun made at Greenwich during the years 1836–1895. The actual value of the correction is the difference between the quantity applied in each catalogue and that derived from the formula

$$+\overset{s}{0}{\cdot}015+\overset{s}{0}{\cdot}132\ \mathrm{T},$$

where T is the fraction of a century from the adopted epoch 1880.

The following are the values of these corrections actually adopted:—

	s		s
1860	−0·004	1880	+0·015
1864	+0·008	1887–1896	+0·028
1872	+0·009		

The adopted right ascensions for the years 1887–1896 are the standard right ascensions adopted in the clock-star list for 1896, corrected by $+0^{s}{\cdot}028$ as above.

The adopted right ascensions for the 1872 and 1880 catalogues are the standard right ascensions given in the introductions to the 1872 and 1880 catalogues.

The adopted right ascensions for the 1860 and 1864 catalogues are the right ascensions given in these catalogues corrected as follows:—The standard right ascensions of the 1872 catalogue were carried back to 1860 and 1864 by means of Struve's precession and the Auwers-Bradley proper motions, and a comparison for each star made between these deduced places and those given in the 1860 and 1864 catalogues. The general mean was then found and taken out, and the resulting corrections were then formed for groups of 1^{h} of R.A., with weights corresponding to the number of observations. These corrections are given under the heading δa_{a} in the following table (a similar table will be found on p. 8 of the introduction to the 1872 catalogue, but depending on the proper motions then in use, which have been superseded by those of Auwers). After the applica-

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tion of these corrections, $\delta\alpha_\alpha$, to the original differences the new quantities were again arranged in groups of 5° of N.P.D. with the same weights, and means formed. These values constitute the corrections depending on N.P.D., and are given under the heading $\delta\alpha_\delta$ in the following table. The extension of a group to more than 5° simply means that the several corrections under each 5° were practically identical. The resultant correction to be applied to the adopted catalogue places will be the algebraic sum of the two corrections, $\delta\alpha_\alpha$ and $\delta\alpha_\delta$.

Corrections to the Places of Clock Stars in the Greenwich 1860 *and* 1864 *Catalogues for Periodic Errors depending on Right Ascension and North Polar Distance* ($\delta\alpha_\alpha$ *and* $\delta\alpha_\delta$), *combined with Equinox Correction of* $-0^s{\cdot}004$ *to the* 1860 *Catalogue, and* $+0^s{\cdot}008$ *to the* 1864 *Catalogue derived from Greenwich* ⊙ *Observations* 1836–95.

R.A.	1860. s $\delta\alpha_\alpha - {\cdot}004$.	1864. s $\delta\alpha_\alpha + {\cdot}008$.	R.A.	1860. s $\delta\alpha_\alpha - {\cdot}004$.	1864. s $\delta\alpha_\alpha + 0{\cdot}012$.
h	s	s		s	s
0	+0·013	+0·024	12	−0·002	+0·012
1	+ ·011	+ ·018	13	− ·006	+ ·012
2	+ ·004	+ ·012	14	− ·014	+ ·008
3	− ·011	+ ·010	15	− ·015	+ ·007
4	− ·017	+ ·005	16	− ·012	+ ·003
5	− ·019	+ ·002	17	− ·011	+ ·001
6	− ·023	− ·005	18	− ·004	+ ·008
7	− ·026	− ·014	19	+ ·005	+ ·017
8	− ·025	− ·015	20	+ ·014	+ ·019
9	− ·022	− ·008	21	+ ·016	+ ·016
10	− ·016	− ·002	22	+ ·020	+ ·018
11	− ·008	+ ·004	23	+ ·019	+ ·024

N.P.D.	1860.	N.P.D.	1864.
° °	s	° °	s
50–55	−0·036		
55–60	− ·030	50–65	−0·016
60–65	− ·023		
65–75	− ·006	65–75	− ·005
75–85	+ ·005	75–85	+ ·002
85–95	+ ·008	85–100	+ ·009
95–105	+ ·012	100–110	+ ·002
105–125	+ ·024	110–125	+ ·013

When necessary, the various catalogue places have been further corrected for any difference in the adopted proper motions (Auwers'), and those used in the catalogues.

Procyon has been specially corrected for orbital motion from Auwers' paper (*Ast. Nach.* 1371–2–3).

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North Polar Distances.—These observations have been corrected to the following uniform system (*Mem. R.A.S.* vol. xlv.), viz.—Flexure=·00; formula for R—D $a+b$ sin z, virtually flexure, Bessel's refractions, and colatitude 38° 31′ 21″·90. This means that the north polar distances of the 1860 and 1864 catalogues have been increased by 0″·10 for colatitude, the value used in the catalogues being 21″·80. The north polar distances of the 1864 and 1872 catalogues have been corrected for R—D by the table given below, and those of 1872 have been further corrected by the table given at the end of the introduction to the 1872 catalogue itself to reduce them to Bessel's refractions and colatitude 21″·90. Like the right ascensions the N.P.D.'s have also been corrected for any differences in the adopted proper motions, and those used in the various catalogues. *Procyon* has also been pecially corrected for orbital motion (see above).

Table of corrections for R—D to reduce the observations 1862–1876 *to the system $a+b$ sin z.*

Year.	60°	70°	80°	90°	100°	110°	120°
	″	″	″	″	″		
1862	·00	−·03	−·11	−·19	−·30	−·37	−·40
3	·00	−·04	−·13	−·23	−·34	−·45	−·48
4	·00	−·02	−·09	−·16	−·24	−·32	−·34
5	·00	−·05	−·14	−·28	−·42	−·55	−·58
6	·00	+·05	+·14	+·29	+·43	+·57	+·60
7	·00	+·04	+·11	+·21	+·32	+·42	+·45
8	·00	+·05	+·17	+·32	+·49	+·64	+·69
9	·00	+·06	+·15	+·29	+·44	+·58	+·63
70	·00	+·04	+·14	+·26	+·39	+·51	+·55
1	·00	+·04	+·14	+·26	+·39	+·51	+·55
2	·00	+·03	+·10	+·19	+·30	+·39	+·42
3	00	+·04	+·11	+·22	+·33	+·43	+·46
4	·00	+·03	+·10	+·19	+·29	+·40	+·42
5	·00	+·02	+·06	+·11	+·18	+·23	+·24
6	·00	+·02	+·07	+·14	+·21	+·27	+·29

From the observations thus corrected and reduced corrections were obtained to the adopted proper motions, as is most easily explained by the following example. Columns (5) and (14) are deduced as follows:—The epoch corresponding to the mean of the group 1887–1896 is regarded as standard, and the number of years elapsed between the epoch and that of any other catalogue is the number of years on which the proper motion depends. In the same way columns (6) and (15) represent the differences of R.A. or N.P.D. between the R.A. and N.P.D. corresponding to the group 1887–1896 regarded as standard and the R.A. and N.P.D. at the other epochs. Columns (7) and (16), the weight, is derived from the expression $\frac{\text{no. of observations} \times \text{years}}{100}$. The remaining columns explain themselves.

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Computation of Corrections to Auwers' Proper Motions.

α Andromedæ

		Adopted P.M. +ˢ·0095				Corrected P.M. +ˢ·0102						Adopted P.M. +″·156				Corrected P.M. +″·150				
Catalogue.	R.A. 1890.	Date. 1800. +	No. of Obs.	No. of Years.	Diff. of R.A.	Wt.	No. of Obs. × Years.	Years × Wt.	Diff. of R.A. × Wt.		N.P.D. 1890.	Date. 1800. +	No. of Obs.	No. of Years.	Diff. of N.P.D.	Wt.	No. of Obs. × Years.	Years × Wt.	Diff. of N.P.D. × Wt.	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10) +	−	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19) +	−
	h m s				s				s	s	° ′ ″				″					″
1860	0 2 42·063	57·8	89	35·4	+·024	21	20·89	743·4	·504		61 31 0·95	58·1	53	34·9	−0·24	18	...	628·2		4·32
1864	·052	64·8	56	28·4	+·035	16	15·92	454·4	·560		0·80	65·2	44	27·8	− ·09	12	...	333·6		1·08
1872	·074	71·7	62	21·5	+·013	13	13·33	279·5	·169		0·76	72·2	64	20·8	− ·05	13	...	270·4		·65
1880	·097	82·1	69	11·1	−·012	8	7·66	88·8		·096	0·86	81·7	42	11·3	·15	5	...	56·5		·75
1887–1896	·087	93·2	131					1566·1	1·233		0·71	93·0	100					1288·7		6·80
									·096											
									1·137											

$$\text{Correction} = \frac{+1^{s}\cdot137}{1566\cdot1} = +^{s}\cdot0007 \qquad \text{Correction} = \frac{-6''\cdot80}{1288\cdot7} = -''\cdot005$$

H H

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In the following table are given the deduced proper motions from the Greenwich Observations, as well as the corrections to Auwers' and Newcomb's systems of proper motions, where system of proper motion means the combined effect of precession, and what is generally termed proper motion.

Table of Proper Motions of the Greenwich Clock Stars from the Greenwich Transit Circ Observations 1854–1896, *and Corrections to Auwers' and Newcomb's Systems of Prop Motions.*

Star.	Approx. R.A.		Approx. N.P.D.		P.M. Right Ascension. Greenwich.	P.M. Right Ascension. Greenwich minus Auwers.	P.M. Right Ascension. Greenwich minus Newcomb.	P.M. North Polar Distance. Greenwich.	P.M. North Polar Distance. Greenwich minus Auwers.	P.M. North Polar Distance. Greenwic minus Newcom
	h	m	°	′	s	s	s	″	″	″
α Androm.	0	3	61	31	+·0102	+·0007	−·0002	+0·150	−·006	−·019
γ Pegasi		8	75	26	+·0002	+·0009	+·0002	+ ·009	−·004	−·007
ι Ceti		14	99	26	−·0019	+·0013	−·0003	+ ·047	+·015	+·012
44 Piscium		20	88	40	−·0013	+·0015	+·0005	+ ·028	+·017	−·001
12 Ceti		24	94	34	+·0003	+·0006	−·0006	+ ·018	+·009	+·011
ε Androm.		33	61	17	−·0178	+·0006	−·0002	+ ·237	−·014	−·022
β Ceti		38	108	35	+·0154	+·0007	−·0003	− ·023	+·011	+·012
δ Piscium		43	83	1	+·0055	+·0020	+·0004	+ ·050	+·013	+·001
20 Ceti		47	91	45	+·0006	+·0028	+·0015	+ ·025	+·016	+·017
μ Androm.		51	52	6	+·0115	−·0026	−·0011	− ·034	+·015	−·010
ε Piscium		57	82	42	−·0056	+·0014	+·0002	− ·022	+·017	−·002
β Androm.	1	4	54	58	+·0144	·0000	+·0002	+ ·110	+·026	−·012
ζ¹ Piscium		8	83	0	+·0086	+·0011	−·0006	+ ·065	+·014	+·008
θ Ceti		19	98	45	−·0058	+·0010	+·0002	+ ·231	+·035	+·010
η Piscium		26	75	13	+·0017	+·0019	+·0007	+ ·006	+·003	−·002
ν Piscium		36	85	4	−·0013	+·0021	+·0005	+ ·002	+·007	+·001
ο Piscium		40	81	24	+·0043	+·0014	−·0003	− ·044	+·014	−·004
β Arietis		49	69	44	+·0067	+·0017	+·0007	+ ·105	+·003	−·009
α Arietis	2	1	67	3	+·0141	+·0014	+·0007	+ ·140	+·006	−·008
ξ¹ Ceti		7	81	40	−·0025	+·0007	−·0008	+ ·026	+·025	+·005
67 Ceti		12	96	56	+·0053	+·0017	+·0002	+ ·117	+·008	+·003
ξ² Ceti		22	82	2	+·0019	+·0008	−·0002	+ ·008	+·007	−·002
ν Ceti		30	84	53	−·0014	+·0037	+·0014	+ ·019	−·009	−·002
δ Ceti		34	90	9	−·0001	−·0005	−·0008	− ·021	−·028	−·019
γ² Ceti		38	87	14	−·0094	+·0020	+·0006	+ ·147	−·009	−·007
σ Arietis		45	75	22	+·0007	+·0009	−·0004	+ ·026	−·013	−·011
ε Arietis		53	69	6	−·0015	+·0010	−·0001	+ ·010	+·004	−·003
α Ceti		57	86	21	−·0005	+·0024	+·0007	+ ·081	+·008	−·002
δ Arietis	3	5	70	41	+·0104	+·0009	−·0001	+ ·005	+·010	+·003
τ¹ Arietis		15	69	15	+·0016	+·0008	−·0002	+ ·018	−·012	−·017
ο Tauri		19	81	22	−·0045	+·0007	+·0006	+ ·097	+·029	+·020

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Star.	Approx. R.A.		Approx. N.P.D.		P.M. Right Ascension.			P.M. North Polar Distance.		
					Greenwich.	Greenwich minus Auwers.	Greenwich minus Newcomb.	Greenwich.	Greenwich minus Auwers.	Greenwich minus Newcomb.
	h	m	°	′	s	s	s	″	″	″
f Tauri	3	25	77	26	+·0008	+·0010	−·0003	+ ·012	+·023	+·012
ε Eridani		28	99	50	−·0668	+·0007	−·0006	− ·023	−·012	+·002
11 Tauri		34	65	2	+·0012	+·0014	+·0003	+ ·006	−·005	−·005
δ Eridani		38	100	8	−·0079	+·0002	−·0016	− ·733	+·010	−·004
η Tauri		41	86	14	+·0017	+·0021	+·0005	+ ·041	+·001	−·011
γ¹ Eridani		53	103	49	+·0046	+·0017	+·0001	+ ·113	+·007	+·002
A¹ Tauri		58	68	13	+·0070	+·0017	+·0006	+ ·052	−·006	−·006
ω¹ Tauri	4	3	70	41	+·0072	+·0011	−·0002	+ ·032	−·001	−·013
o¹ Eridani		7	97	8	+·0003	+·0009	+·0001	− ·090	−·005	−·006
γ Tauri		14	74	38	+·0080	+·0007	+·0002	+ ·014	−·016	−·013
ε Tauri		22	71	4	+·0084	+·0014	+·0008	+ ·018	−·010	−·016
Aldebaran		30	73	43	+·0052	+·0017	+·0012	+ ·178	−·006	−·011
τ Tauri		36	67	15	+·0004	+·0014	+·0003	+ ·025	+·016	+·007
μ Eridani		40	93	27	+·0011	+·0013	+·0002	+ ·014	+·012	+·004
ι Aurigæ		50	57	1	+·0010	+·0004	+·0001	+ ·014	+·011	−·006
ε Leporis	5	1	112	31	+·0020	+·0016	+·0009	+ ·042	−·026	−·021
Rigel		9	98	20	+·0007	+·0019	+·0009	− ·007	−·002	−·007
β Tauri		19	61	29	+·0027	+·0014	+·0008	+ ·156	−·024	−·019
δ Orionis		26	90	23	+·0007	+·0021	+·0011	+ ·005	·000	+·004
α Leporis		28	107	54	−·0009	+·0002	−·0009	·000	+·010	·000
ε Orionis		31	91	16	+·0008	+·0026	+·0012	− ·005	+·001	−·004
α Columbæ		36	124	8	−·0015	...	+·0021	...	...	...
κ Orionis		43	99	43	+·0009	+·0026	+·0011	+ ·005	+·009	+·002
α Orionis		49	82	37	+·0020	+·0012	+·0003	− ·011	+·013	−·001
1 Geminor.		57	66	44	−·0011	−·0001	−·0008	+ ·108	+·015	+·002
ν Orionis	6	1	75	13	+·0001	+·0004	−·0007	+ ·043	+·030	+·021
η Geminor.		8	67	28	−·0057	−·0007	−·0013	+ ·006	+·003	−·008
μ Geminor.		16	67	26	+·0043	+·0006	+·0003	+ ·096	−·005	−·014
β Canis Maj.		18	107	54	−·0012	+·0003	−·0003	+ ·019	+·022	+·025
ν Geminor.		22	69	43	−·0002	+·0020	+·0009	+ ·011	+·005	−·001
γ Geminor.		31	73	30	+·0038	+·0015	+·0010	+ ·039	+·004	−·004
ξ Geminor.		39	76	59	−·0086	+·0001	−·0005	+ ·192	−·003	+·002
θ Canis Maj.		49	101	54	−·0096	+·0009	−·0004	+ ·033	+·030	+·029
ε Canis Maj.		54	118	49	−·0011	·0000	−·0007	− ·005	+·012	+·002
ζ Geminor.		58	69	19	−·0016	−·0005	−·0009	− ·009	−·008	−·012
γ Canis Maj.		59	105	28	−·0013	+·0005	−·0014	+ ·023	+·020	+·017
51 Geminor.	7	7	73	39	+·0006	+·0003	−·0009	+ ·034	+·001	−·004

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Star.	Approx. R.A.	Approx. N.P.D.	P.M. Right Ascension. Greenwich.	Greenwich minus Auwers.	Greenwich minus Newcomb.	P.M. North Polar Distance. Greenwich.	Greenwich minus Auwers.	Greenwic minus Newcom
	h m	° ′	s	s	s	″	″	″
δ Geminor.	7 14	67 48	−·0017	+·0008	−·0002	+ ·008	+·011	−·00
β Canis Min.	21	81 29	−·0039	+·0003	−·0003	+ ·040	+·010	−·00
Castor	28	57 52	−·0138	+·0013	+·0011	+ ·089	+·010	+·011
Procyon	34	84 30	−·0464	+·0010	+·0012	+ 1·037	+·010	+·00
Pollux	39	61 42	−·0464	+·0017	+·0011	+ ·048	−·003	−·002
ξ Argus	45	114 35	−·0018	−·0007	−·0013	+ ·018	+·042	+·02
6 Cancri	57	61 54	−·0018	+·0007	−·0003	+ ·030	−·009	−·01
ρ Argus	8 3	113 59	−·0068	+·0007	−·0002	− ·043	+·018	+·01
β Cancri	11	80 28	−·0043	+·0001	−·0004	+ ·041	·000	−·007
d^1 Cancri	17	71 19	−·0042	+·0011	·0000	+ ·009	−·013	−·017
η Cancri	26	69 11	−·0030	+·0009	·0000	+ ·039	−·008	−·011
γ Cancri	37	68 8	−·0078	+·0009	−·0003	+ ·039	+·006	+·001
ε Hydræ	41	83 11	−·0132	+·0003	−·0001	+ ·051	+·028	+·007
α Cancri	52	77 43	+·0024	+·0014	+·0003	+ ·033	+·011	−·002
κ Cancri	9 2	78 53	−·0013	+·0015	+·0003	·000	+·009	−·007
83 Cancri	13	71 50	−·0089	+·0001	−·0010	+ ·123	−·016	−·007
α Hydræ	22	98 11	−·0016	+·0003	−·0002	− ·037	+·015	+·002
ξ Leonis	26	78 13	−·0068	+·0008	−·0002	+ ·095	+·035	+·017
ο Leonis	35	79 36	−·0103	+·0001	−·0005	+ ·027	+·009	·000
ε Leonis	40	65 43	−·0035	+·0008	+·0003	+ ·007	−·001	−·009
μ Leonis	47	63 29	−·0168	+·0017	+·0007	+ ·048	+·003	·000
π Leonis	54	81 26	+·0028	+·0012	+·0005	+ ·016	+·005	−·004
Regulus	10 3	77 30	−·0166	+·0016	+·0006	− ·010	+·008	−·004
$γ^1$ Leonis	14	69 36	+·0218	+·0010	+·0009	+ ·134	−·002	−·011
μ Hydræ	21	106 17	−·0103	−·0005	·0000	+ ·067	+·006	−·007
ρ Leonis	27	80 8	−·0010	+·0002	−·0003	− ·002	+·009	+·001
34 Sextantis	37	85 51	−·0065	+·0025	−·0004	− ·036	−·003	−·002
l Leonis	43	78 52	−·0008	+·0007	−·0022	+ ·028	+·008	+·001
d Leonis	55	85 48	+·0006	+·0024	+·0004	− ·005	−·017	−·021
χ Leonis	59	82 4	−·0235	+·0020	+·0002	+ ·034	+·012	·000
δ Leonis	11 8	68 52	+·0099	−·0003	−·0005	+ ·126	+·011	−·008
δ Crateris	14	104 11	−·0094	+·0012	−·0002	− ·197	+·012	+·004
τ Leonis	22	86 32	+·0008	+·0018	+·0003	+ ·013	+·007	+·003
υ Leonis	31	90 13	−·0003	+·0015	·0000	− ·056	−·009	−·011
β Leonis	43	74 49	−·0347	+·0009	−·0002	+ ·109	+·011	−·003
β Virginis	45	87 37	+·0492	+·0011	+·0002	+ ·267	+·005	−·002
π Virginis	55	82 46	−·0008	+·0020	+·0004	+ ·029	+·012	+·003

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Star.	Approx. R A.		Approx. N.P.D.		P.M. Right Ascension.			P.M. North Polar Distance.		
					Greenwich.	Greenwich minus Auwers.	Greenwich minus Newcomb.	Greenwich.	Greenwich minus Auwers.	Greenwich minus Newcomb.
	h	m	°	′	s	s	s	″	″	″
ο Virginis	11	59	80	59	−·0155	+·0004	−·0004	− ·040	+·009	−·001
ε Corvi	12	4	112	0	−·0067	−·0008	−·0012	− ·005	+·016	+·003
η Virginis		14	90	3	−·0045	+·0011	−·0006	+ ·020	−·002	−·002
δ^2 Corvi		24	105	54	−·0161	−·0019	−·0017	+ ·140	−·006	−·002
β Corvi		29	112	47	−·0017	+·0016	−·0006	+ ·057	+·005	+·002
ρ Virginis		36	79	9	+·0047	+·0014	−·0010	+ ·083	−·005	−·018
35 Virginis		42	85	50	−·0010	+·0020	−·0003	+ ·005	−·001	−·001
31 Comæ		46	61	52	−·0020	+·0007	+·0005	+ ·001	−·017	−·017
δ Virginis		50	86	0	−·0320	+·0016	+·0002	+ ·061	+·014	+·006
ε Virginis		57	78	27	−·0192	·0000	−·0002	− ·023	+·006	−·002
θ Virginis	13	4	94	57	−·0034	+·0009	·0000	+ ·031	−·006	−·002
Spica		19	100	35	−·0025	+·0019	−·0008	+ ·037	+·019	+·011
ζ Virginis		29	90	2	−·0195	+·0010	+·0003	− ·039	+·017	+·005
m Virginis		36	98	9	−·0076	+·0009	+·0001	− ·036	+·010	+·002
τ Boötis		42	72	0	−·0345	+·0001	−·0001	− ·033	+·007	−·003
η Boötis		49	71	3	−·0049	·0000	−·0003	+ ·354	+·010	−·004
τ Virginis		56	87	55	+·0007	+·0012	·0000	+ ·011	−·022	−·012
94 Virginis	14	0	98	21	−·0002	+·0030	+·0013	− ·022	−·010	−·009
κ Virginis		7	99	46	−·0007	−·0003	−·0009	− ·138	+·003	−·001
Arcturus		11	70	15	−·0781	+·0018	·0000	+ 1·989	+·012	−·011
f Boötis		21	70	17	−·0053	+·0004	·0000	− ·026	+·003	−·006
ρ Boötis		27	59	9	−·0080	+·0005	−·0005	− ·125	·000	−·007
ϵ^2 Boötis		40	62	28	−·0032	+·0011	+·0004	− ·021	−·020	−·007
α Libræ		45	105	35	−·0076	+·0017	+·0007	+ ·071	−·001	·000
ξ^2 Libræ		51	100	58	−·0002	+·0017	+·0008	− ·010	−·004	−·008
ψ Boötis		59	62	37	−·0126	+·0019	+·0008	− ·001	−·009	−·012
ι^1 Libræ	15	6	109	22	−·0030	+·0007	+·0006	+ ·038	−·004	−·012
β Libræ		11	98	59	−·0072	+·0007	−·0002	+ ·020	+·003	−·001
o^2 Libræ		17	104	44	−·0005	+·0020	+·0004	− ·018	−·005	−·012
ζ^1 Libræ		22	106	20	−·0001	+·0009	−·0002	+ ·034	−·012	−·006
α Coronæ		30	62	55	+·0094	+·0009	+·0006	+ ·082	−·012	−·015
α Serpentis		39	83	14	+·0096	+·0017	+·0011	− ·051	+·005	−·006
ε Serpentis		45	85	11	+·0089	+·0021	+·0011	− ·059	·000	+·013
γ Serpentis		51	73	59	+·0213	+·0019	+·0004	+ 1·272	−·014	−·015
β^1 Scorpii		59	109	30	−·0023	+·0003	−·0006	+ ·011	−·016	−·014
δ Ophiuchi	16	9	93	25	−·0036	+·0013	−·0002	+ ·157	+·020	+·015
γ Herculis		17	70	35	−·0032	+·0017	+·0004	− ·045	+·003	−·007

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Star.	Approx. R.A.		Approx. N.P.D.		P.M. Right Ascension.			P.M. North Polar Distance.		
					Greenwich.	Greenwich minus Auwers.	Greenwich minus Newcomb.	Greenwich.	Greenwich minus Auwers.	Greenwic minus Newcom
	h	m	°	′	s	s	s	″	″	″
Antares	16	23	116	11	−·0009	+·0013	+·0003	+ ·046	+·018	+·017
λ Ophiuchi		25	87	46	−·0026	+·0001	−·0001	+ ·081	+·016	+·003
ζ Ophiuchi		31	100	21	+·0002	+·0009	·0000	− ·018	+·017	+·004
ζ Herculis		37	58	12	−·0365	−·0009	·0000	− ·385	+·025	+·007
κ Ophiuchi		53	80	27	−·0193	+·0019	+·0009	+ ·011	+·026	+·001
ε Herculis		56	58	55	−·0039	+·0008	−·0002	− ·039	−·007	−·015
η Ophiuchi	17	4	105	35	+·0023	+·0020	+·0011	− ·087	+·010	+·003
α¹ Herculis		10	75	29	−·0008	+·0011	+·0002	− ·042	−·012	−·014
θ Ophiuchi		15	114	53	−·0018	+·0006	−·0007	+ ·030	−·005	−·004
σ Ophiuchi		21	85	46	+·0009	+·0026	+·0011	− ·003	+·012	+·005
α Ophiuchi		30	77	22	+·0081	+·0015	+·0004	+ ·230	+·013	−·005
β Ophiuchi		38	85	23	−·0023	+·0018	+·0006	− ·157	+·010	−·001
μ Herculis		42	62	13	−·0248	−·0004	−·0009	+ ·727	−·018	−·024
89 Herculis		51	63	56	+·0009	+·0006	−·0001	− ·017	−·008	−·012
72 Ophiuchi	18	2	80	27	−·0032	+·0024	+·0015	− ·087	+·002	−·003
μ Sagittarii		7	111	5	−·0004	+·0010	+·0005	+ ·013	+·014	+·010
η Serpentis		16	93	0	−·0377	+·0023	+·0004	+ ·707	+·030	+·023
λ Sagittarii		21	115	29	−·0053	−·0001	−·0015	+ ·184	−·014	−·020
α Lyræ		33	51	19	+·0183	+·0010	+·0007	− ·284	+·011	−·007
2 Aquilæ		36	99	9	+·0008	+·0012	−·0008	− ·004	+·001	−·013
β¹ Lyræ		46	56	46	+·0006	+·0013	+·0004	+ ·009	+·026	+·001
ε Aquilæ		55	75	5	−·0037	+·0012	+·0007	+ ·085	+·005	+·001
ζ Aquilæ	19	0	76	18	−·0003	+·0023	+·0007	+ ·096	+·007	−·008
ψ Sagittarii		9	115	27	+·0032	+·0028	+·0011	+ ·040	+·011	+·001
ω Aquilæ		13	78	36	·0000	+·0014	+·0005	− ·011	+·014	−·001
δ Aquilæ		20	87	6	+·0176	+·0023	+·0012	− ·081	+·010	−·004
α Vulpec.		24	65	33	−·0092	+·0016	+·0006	+ ·103	+·001	−·011
μ Aquilæ		29	82	51	+·0145	+·0016	+·0003	+ ·155	+·022	+·005
h² Sagittarii		30	115	8	+·0029	+·0013	−·0011	+ ·021	+·011	−·011
e¹ Sagittarii		34	106	33	+·0027	+·0001	−·0014	+ ·038	−·001	−·014
γ Aquilæ		41	79	39	+·0010	+·0015	+·0005	+ ·004	+·012	−·003
α Aquilæ		45	81	25	+·0363	+·0012	+·0007	− ·372	+·012	+·001
β Aquilæ		50	83	52	+·0026	+·0019	+·0004	+ ·469	−·004	−·017
c Sagittarii		56	118	1	+·0020	+·0016	+·0001	− ·003	+·021	+·005
θ Aquilæ	20	6	91	9	+·0023	+·0024	+·0007	− ·011	+·003	−·010
α² Capricorni		12	102	53	+·0036	+·0014	−·0001	+ ·003	+·020	+·020
β Capricorni		15	105	8	+·0023	+·0015	−·0004	− ·002	+·020	·000

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Star.	Approx. R.A.		Approx. N.P.D.		P.M. Right Ascension.			P.M. North Polar Distance.		
					Greenwich.	Greenwich minus Auwers.	Greenwich minus Newcomb.	Greenwich.	Greenwich minus Auwers.	Greenwich minus Newcomb.
	h	m	°	′	s	s	s	″	″	″
ρ Capricorni	20	23	108	11	−·0017	+·0011	+·0001	+ ·030	+·023	+·004
Σ Delphini		28	79	4	+·0001	+·0007	−·0003	+ ·027	+·005	−·003
α Delphini		35	74	29	+·0045	+·0014	+·0001	+ ·002	·000	−·011
ε Aquarii		42	99	54	+·0018	+·0020	−·0005	+ ·039	+·012	+·003
μ Aquarii		47	99	24	+·0027	+·0019	+·0005	+ ·030	−·001	−·015
32 Vulpec.		50	62	22	−·0003	+·0013	+·0001	− ·010	−·012	−·011
θ Capricorni		59	107	40	+·0057	+·0017	+·0010	+ ·066	+·012	−·006
ζ Cygni	21	8	60	13	+·0004	+·0019	+·0008	+ ·050	−·016	−·018
α Equulei		10	85	12	+·0043	+·0022	+·0013	+ ·088	+·010	−·003
ι Capricorni		16	107	18	+·0017	+·0020	−·0003	+ ·007	+·020	+·005
β Aquarii		26	96	3	+·0020	+·0026	+·0012	+ ·006	+·005	−·010
ξ Aquarii		32	98	21	+·0076	+·0018	+·0004	+ ·021	−·001	−·011
ε Pegasi		39	80	38	+·0011	+·0003	−·0001	− ·003	+·008	+·010
δ Capricorni		41	106	38	+·0171	+·0005	−·0001	+ ·313	+·016	+·010
16 Pegasi		48	64	36	−·0002	+·0003	−·0005	− ·009	−·011	−·009
α Aquarii	22	0	90	51	+·0006	+·0014	·0000	+ ·009	+·0 1	·000
ι Pegasi		2	65	12	+·0222	+·0013	+·0002	− ·043	−·023	+·028
θ Aquarii		11	98	20	+·0076	+·0019	+·0006	+ ·033	+·014	+·008
γ Aquarii		16	91	56	+·0075	+·0007	−·0002	+ ·002	+·019	+·011
σ Aquarii		25	101	14	−·0008	+·0003	−·0004	+ ·027	−·010	−·005
η Aquarii		30	90	41	+·0057	+·0015	+·0004	+ ·063	+·010	+·004
ζ Pegasi		36	79	45	+·0045	+ 0001	−·0007	+ ·010	−·008	−·011
μ Pegasi		45	65	59	−·0100	+·0004	−·0008	+ ·035	−·007	−·013
λ Aquarii		47	98	10	+·0005	+·0021	+·0007	− ·026	+·014	+·002
Fomalhaut		52	120	12	+·0249	+·0017	·0000	+ ·179	+·020	·000
α Pegasi		59	75	23	+·0037	+·0009	−·0001	+ ·036	+·006	−·010
γ Piscium	23	11	87	19	+·0499	+·0012	+·0001	− ·021	−·004	−·007
κ Piscium		21	89	20	+·0057	+·0016	+·0004	+ ·088	−·014	−·012
ι Piscium		34	84	58	+·0244	+·0010	+·0001	+ ·433	−·010	−·008
δ Sculptoris		43	118	44	+·0073	...	−·0021	+ ·137	...	+·003
ω Piscium		54	83	45	+·0097	+·0010	−·0002	+ ·107	−·001	−·006
2 Ceti		58	107	57	+·0009	+·0010	−·0002	+ ·026	+·031	+·006

The two following tables give the differences between the Greenwich system of proper motions and those of Auwers and Newcomb for each hour of right ascension, and for each 5° of N.P.D. from 60° to 120°. The first group extends to 10°, on account of the paucity of stars. Equal weight has been given to each star :—

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Corrections to Auwers' and Newcomb's Systems of Proper Motions, arranged in order of R.A.

R.A.	No. of Stars.	P.M. in R.A. Gr.—A.	P.M. in R.A. Gr.—N.	P.M. in N.P.D. Gr.—A.	P.M. in N.P.D. Gr.—N.
h		s	s	″	″
0	11	+·00090	·00000	+·0082	−·0006
1	7	+·00131	+·00020	+·0145	−·0012
2	10	+·00143	+·00014	−·0003	−·0047
3	10	+·00112	−·00007	+·0043	−·0006
4	8	+·00111	+·00033	+·0001	−·0070
5	9	+·00150	+·00051	−·0004	−·0048
6	11	+·00046	−·00036	+·0100	+·0052
7	8	+·00068	+·00006	+·0083	+·0007
8	7	+·00077	−·00010	+·0060	−·0021
9	8	+·00081	−·00001	+·0074	−·0010
10	8	+·00124	−·00022	+·0032	−·0048
11	8	+·00108	−·00004	+·0073	−·0018
12	9	+·00063	−·00055	+·0013	−·0035
13	7	+·00086	+·00012	+·0050	−·0004
14	9	+·00131	+·00029	−·0029	−·0068
15	9	+·00124	+·00035	−·0059	−·0076
16	8	+·00089	+·00014	+·0147	+·0028
17	8	+·00123	+·00022	+·0002	−·0068
18	8	+·00129	+·00024	+·0094	−·0009
19	12	+·00163	+·00030	+·0098	−·0046
20	10	+·00154	+·00022	+·0082	−·0031
21	8	+·00145	+·00034	+·0038	−·0058
22	11	+·00112	−·00002	+·0042	−·0038
23	5	+·00116	+·00004	+·0004	−·0060

Corrections to Auwers' and Newcomb's Systems of Proper Motions, arranged in order of N.P.D.

N.P.D.	No. of Stars.	P.M. in R.A. Gr.—A.	P.M. in R.A. Gr.—N.	P.M. in N.P.D. Gr.—A.	P.M. in N.P.D. Gr.—N.
° °		s	s	″	″
50–60	10	+·00038	+·00009	+·0119	−·0051
60–65	15	+·00101	+·00024	−·0112	−·0130
65–70	21	+·00087	+·00004	+·0002	−·0037
70–75	17	+·00100	+·00008	−·0012	−·0088
75–80	23	+·00102	−·00010	+·0069	−·0009
80–85	26	+·00124	+·00018	+·0092	·0000
85–90	20	+·00183	+·00045	+·0024	−·0027
90–95	16	+·00144	+·00023	+·0066	+·0017
95–100	19	+·00148	+·00025	+·0060	−·0014

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N.P.D.	No. of Stars.	P.M. in R.A. Gr.−A.	P.M. in R.A. Gr.−N.	P.M. in N.P.D. Gr.−A.	P.M. in N.P.D. Gr.−N.
° °		s	s	″	″
100–105	10	+·00117	−·00011	+·0107	+·0052
105–110	18	+·00071	−·00024	+·0089	+·0007
110–115	7	+·00057	−·00037	+·0084	+·0030
115–120	7	+·00117	−·00031	+·0107	−·0013
Mean	209	+·00112	+·00008	+·0050	−·0028

From the above comparison it would appear that the system of proper motions in Newcomb's new Fundamental Catalogue of Right Ascensions are practically identical with those that have been deduced as the Greenwich system of proper motions, while the correction to Auwers' system of proper motions indicates an erroneous epoch correction applied to the Bradley observations. With regard to the North Polar distances the Greenwich mean results stand almost midway between those of Auwers and Newcomb. There is a distinct run in the results both of R.A. and N.P.D. arranged in order of N.P.D., the error of which, on the average, for the Greenwich results would only amount to $\pm 0^{s}\cdot 01$ or $\pm 0''\cdot 12$ in the observed places at the extreme ranges. The result of the group in N.P.D. under the heading N.P.D. 60°–65° is distinctly anomalous, but most consistent. To hazard an explanation one would be inclined to suggest Bradley division errors.

In *Monthly Notices*, lvi. p. 6, I deduced the proper motions of some 45 fundamental stars from the Greenwich Observations, 1836–93; those in right ascension are affected by the systematic errors referred to above, and are not compared; but those in N.P.D., which are based on the same system of reductions, are compared in the following table, and the differences exhibited as corrections to Newcomb's system:—

Comparison between the Proper Motions in North Polar Distance derived from the Greenwich Observations, 1836–93 (*Monthly Notices,* vol. lvi. p. 6) (Gr_{57}), *and from the Greenwich Transit Circle,* 1854–96 (Gr_{42}).

Star.	Gr_{57}−N.	Gr_{42}−N.	Star.	Gr_{57}−N.	Gr_{42}−N.
	″	″		″	″
α Andromedæ	−0·013	−0·019	η Boötis	−0·006	−0·004
γ Pegasi	− ·003	− ·007	Arcturus	− ·006	− ·011
μ Andromedæ	− ·006	− ·010	ϵ^2 Boötis	− ·003	− ·007
β Andromedæ	− ·011	− ·012	α Coronæ	− ·003	− ·015
α Arietis	+ ·002	− ·008	α Serpentis	− ·003	− ·006
α Ceti	− ·010	− ·002	ζ Herculis	+ ·005	+ ·007
Aldebaran	− ·005	− ·011	α Herculis	− ·002	− ·014
Rigel	− ·005	− ·007	α Ophiuchi	− ·004	− ·005
β Tauri	− ·010	− ·019	α Lyræ	+ ·002	− ·007
α Orionis	− ·004	− ·001	β Lyræ	− ·001	+ ·001

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Star.	Gr_{67}—N.	Gr_{42}—N.	Star.	Gr_{57}—N.	Gr_{42}—N.
	″	″		″	″
Castor	+ ·013	+ ·011	γ Aquilæ	+ ·005	− ·003
Procyon	− ·005	+ ·005	α Aquilæ	+ ·009	+ ·001
Pollux	+ ·001	− ·002	β Aquilæ	− ·005	− ·017
Regulus	+ ·006	− ·004	$α^2$ Capricorni	+ ·016	+ ·020
β Leonis	+ ·006	− ·003	α Aquarii	− ·011	·000
Spica	+ ·002	+ ·011	α Pegasi	·000	− ·010
			Mean	− ·0015	− ·0049

Apparently the longer system of observations gives results more accordant with those of Newcomb, but the difference in mean results points to a certain amount of discordance between the transit circle and mural circle observations.

The results of this paper appear to confirm the theory that the greater accuracy of modern instruments counterbalances the advantages of the older observations in point of time, and afford evidence of the limits of accuracy which can be attained in determining proper motions from different groups of well observed star places.

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Observations of Comet b 1898 (*Perrine*), *made at the Royal Observatory, Greenwich.*

(*Communicated by the Astronomer Royal.*)

The observations were made with the Sheepshanks Equatorial, aperture 6·7 inches, by taking transits over two cross-wires at right angles to each other, and each inclined 45° to the parallel of declination. Magnifying power 55.

1898.	Greenwich Mean Solar Time.	Observer.	☄−✱R.A.	Corr. for Refraction.	Log. Factor of Parallax.	☄−✱N.P.D.	Corr. for Refraction.	Log. Factor of Parallax.	No of Comps.	Apparent R.A.	Apparent N.P.D.	Comp. Star.
	d h m s		m s	s		′ ″	″			h m s	° ′ ″	
Apr.	15 14 42 16	B.	−2 4·61	−0·01	9·6805	−7 32·0	−0·3	0·7780	4	23 12 56·52	48 21 20·6	*a*
	22 13 42 48	W.	+0 13·84	−0·01	9·6625	−4 7·4	−0·3	0·8313	6	23 48 51·04	43 42 7·3	*b*
	22 14 2 44	S.	−0 18·15	+0·01	9·6826	+5 29·1	+0·3	0·8110	6	23 48 57·60	43 41 34·1	*c*
	23 14 26 31	B.	−0 50·54	−0·01	9·7051	−5 43·0	−0·2	0·7833	3	23 54 20·68	43 5 56·0	*d*
	23 14 31 32	,,	−0 12·05	+0·01	9·7084	+7 42·6	+0·3	0·7772	3	...	...	*e*
	30 14 4 56	S.	+1 46·75	+0·01	9·7084	+7 1·2	+0·4	0·8042	8	...	...	*f*
	30 14 4 56	,,	+1 14·77	0·00	9·7084	−0 13·9	0·0	0·8042	8	...	...	*g*